

This response was submitted to the consultation held by the Nuffield Council on Bioethics on Emerging biotechnologies between April 2011 and June 2011. The views expressed are solely those of the respondent(s) and not those of the Council.

**Response to the Consultation Paper on
Emerging Biotechnologies
from Professor Derek Burke
9/06/2011**

1 How would you define an 'emerging technology' and an 'emerging biotechnology'? How have these terms been used by others?

The discussion on pages 4 and 5 is balanced but I'm not in favour of a precise definition since opportunities for development of a new technology are not necessarily always apparent immediately – who could have foreseen or planned the development and consequences that the world wide web, set up to deal with the problem of large amounts of data, has had for society? Technologies can be oversold by their champions but also prematurely criticised by those who fear change for a variety of reasons.

2 Do you think that there are there features that are essential or common to emerging biotechnologies? (If so, please indicate what you think these are.)

I do not think that the pursuit of such precise definitions is a useful way to proceed. I regard myself as a "principled pragmatist" and prefer to deal with issues as and when they arise. For example, I was involved in the funding of major initiative on the molecular biology of nitrogen fixation in 1982 with the attractive targets of producing wheat which could fix nitrogen intrinsically, but now almost 30 years later, the technology is still "emerging" and is unlikely to be practical that within the next ten years. So why strain at legalistic issues?

3 What currently emerging biotechnologies do you consider have the most important implications ethically, socially and legally?

Genetic modification of crops is an obvious example of a technology which has emerged in that many products derived with the use of this technology are now in use, nearly everywhere except in Europe, where it is still an "emerging technology". Clarification of the unresolved issues that inhibit the acceptable use this technology is important in view of the widely accepted need for an increase in world food production. Synthetic biology is the next obvious candidate; the production of semi-synthetic organisms is clearly only a few years away, for use for example in the production of ethanol from biomass. Here there are certainly ethical issues, especially environmental ones. The development of DNA fingerprinting for forensic use has been an extremely important new technology, and the ethical issues there I think have been resolved. Finally issues over the genetic modification of embryos in vivo is strewn with ethical issues, but interest will not go away.

4 Are there examples where social, cultural and geographical factors have influenced the development of emerging biotechnologies (either in the past or currently)?

5 Are there examples where social, cultural and geographical factors have influenced public acceptance or rejection of emerging biotechnologies?

6 Are there examples where internationalisation or globalisation of research, markets and regulation have influenced the development of emerging biotechnologies?

Genetic modification of plants is the obvious case study here, and I attach two recent articles of my own which analyse the different issues which have arisen.

7 How have political traditions (such as liberal democracy) and political conditions (e.g. war) influenced the emergence of biotechnologies?

I do not consider that such political issues have had any bearing on the acceptance of genetic modification of plants in North America and its rejection in Europe. Both are liberal democracies and the reasons for the different responses lie elsewhere; including the more ready acceptance of new technologies in North America, the separation of the extensive agricultural development from cities, for example on the Middle West and also I believe, the greater social role that food consumption plays in Europe. My own view is that the major factor has been different attitudes to new technology, and as one Midwestern farmer put it: "My grandfather broke the sod in Illinois and we have prospered since then by always taking with the advice of the Government agricultural advisers. We see no reason to change over genetic modification". So trust in a technically based advisory system has been much more important than opposition from environmental groups.

8 Are there ethical or policy issues that are common to most or many emerging biotechnologies? Are there ethical or policy issues that are specific to emerging biotechnologies? Which of these, if any, are the most important?

My view is that in general societal and political issues tend to transfer current, often latent, concerns, on to new technologies, leading to unexpected resistance. Such concerns are, for example, concerns about the patent system, the dominance of new technologies by multinationals, the problem of the poor farmer versus the highly developed agriculture of say North America, concerns about what is "natural" as opposed to genetic modification which is seen as "unnatural", widening to concerns about "playing God". These concerns are real, and tend to surface about new technologies, which are seen as threatening in a world where our future is certainly insecure. Scientists tend to be impatient with such objections, and importantly do not know how to handle them. The politicians, on the other hand, do not want to pick the issues up because they are too difficult, especially given the short time nature of UK politics. So deadlock ensues.

9 Do you think that some social and ethical themes are commonly overlooked in discussions about emerging biotechnologies? If so, what are they?

It is not that such themes are overlooked or dismissed rather that they are not anticipated, and only seen with hindsight. I was chairman of the ACNFP when we recommended to the Minister that GM soya was safe, and I'm still confident that our

judgment was correct. We did not anticipate the opposition because we saw the genetic modification as no more than a more precise development of the random process of the plant breeding, involving as it does, random mutation, followed by selection. With hindsight we are often blamed for not anticipating this; but I still think that the way we perceived it was reasonable, particularly since the task of the committee was to advise the Minister about the safety of foods, and only much later about ethical and social issues. This latter was done by adding both a consumer representative and an ethical adviser to the committee. The only precedent for such a composition that I knew of at that time was the committee that was responsible for regulation of genetic modification, where the committee consisted of tripartite representation of scientists, trade union representatives, and broader society. But that was after the debate that followed Asimolar. So I think there has been far too much of the 'wisdom of hindsight', and too little understanding of what the scientists were being asked to do. It must be remembered that these committees were appointed by Ministers, were not elected, and the committees were given very strong terms of reference. I can remember an incident with in the early nineties when we thought that the development of a particular genetically-modified product did not make market sense, and were told very firmly that we were outside the scope of our terms of reference. It also has to be remembered that the only public relations support available then was Departmental and that was primarily concerned with defence of the Minister. The Science Media Centre was still some years away

10 What evidence is there that ethical, social and policy issues have affected decisions in (i) setting research priorities, (ii) setting priorities for technological development, and (iii) deploying emerging biotechnologies, in either the public or private sector?

There are areas in the biosciences where ethical issues are obvious; for example, work on mind changing drugs, animal experiments and experiments using cells from the early embryo. These have been fully debated, within science, with the public and often in Parliament. In the broader sense of "ethical, social and policy issues" much of the bioscience research of my lifetime has been ultimately concerned with animal and human health, food production and the environment. I worked with interferon and animal viruses for example for 25 years when these issues were immediately apparent. So it is misleading, as is sometimes said, to portray the scientist blundering on without thinking why and what they're doing. Understanding the world about us is of course a primary drive to the scientist, but especially in medical research, but so is the relieving human suffering. Research also has to consider what is possible, so although we have been trying to cure cancer for most of my lifetime, the research that opened up the field came through a study of the tumour viruses of mice and fowl in the seventies, and was contingent upon broader advances in molecular biology. I have read that the Demos papers about "upstream dialogue" but I'm sceptical about the usefulness of this approach because it is so difficult to identify the social and ethical issues before the science is started.

I am not saying of course that such issues are irrelevant, but my view is that they are rarely anticipated, and I think that the best way to proceed is one of principled pragmatism. This could be done, for example, by setting up committees covering the

broad areas of the biosciences where such issues are likely to arise, perhaps three to five committees, including in them scientists working at the cutting edge of research, philosophers, social scientists and theologians with a brief to keep a watch on a particular field, and to pick up new issues as quickly as they can. I feel strongly that such committees should be non-departmental, as was the Food Standards Agency until recently, and therefore removed from direct political pressure.

11 What ethical principles should be taken into account when considering emerging biotechnologies? Are any of these specific to emerging biotechnologies? Which are the most important?

I have no comments to make on this question.

12 Who should bear responsibility for decision making at each stage of the development of an emerging biotechnology? Is there a clear chain of accountability if a risk of adverse effects is realised?

The Minister, with the assistance of the Chief Scientific Adviser, has responsibility through Parliament for all such decisions. It is up to the Minister to decide what is the appropriate chain of responsibility.

13 What roles have 'risk' and 'precaution' played in policy decisions concerning emerging biotechnologies?

This is an impossible question to answer in such a short questionnaire; whole books have been written on this subject and no doubt the Working Party is well briefed. However, it is worth saying that there is no such thing as "no risk" and that while I accept that the "perception of risk" is partly socially determined and partly determined by evidence; the two are often confused, and the "precautionary principle" is often used as an excuse for inaction. There are no risk-free solutions; in my view, so the first step is to identify and minimise the scientific risk and the second is to seek to identify and if possible, resolve societal concerns. However this process is not well developed in the UK, for example after exhaustive discussion of the pros and cons of culling badgers to reduce the risk of TB in cattle, it appears that it is going to be settled by a popular plebiscite. Why bother asking scientists if that is what the politicians are reduced to!

14 To what extent is it possible or desirable to regulate emerging biotechnologies via a single framework as opposed to individually or in small clusters?

I am opposed to such an approach; it will reduce to the exchange of dogmatic statements for and against, there are no shortcuts.

15 What role should public opinion play in the development of policy around emerging biotechnologies?

Politicians clearly cannot proceed with the approval of a new technology when faced with overwhelming rejection by the public, but to rely on public opinion only is to rely

on something that is inevitably changeable, and can be fickle. The media, together with the lobby groups are very important, and it is not easy to see how to fairly inform the public. The public readily understands the possible benefits, and the public is good at weighing up possible benefits against possible risks – and this was probably the key leading to the acceptance of work with stem cells and the rejection, to date, of GM crops, although that is changing now that the cost of and supply of sufficient food is an active political issue. But the scientific community finds itself in a difficult position in such public debates, and I have been in many. It is clear that scientists should be readily available to the media; newspapers radio and TV, for interview and explanation. But these are nearly always adversarial and the scientist is manoeuvred from the position of providing information to one of protagonist. So how can the scientific community best insert its voice? The Working Party could do well to give some help to resolve this difficulty.

16 What public engagement activities are, or are not, particularly valuable with respect to emerging biotechnologies? How should we evaluate public engagement activities?

17 Is there something unique about emerging biotechnologies, relative to other complex areas of government policy making, that requires special kinds of public engagement outside the normal democratic channels?

I cannot give brief replies to such wide ranging questions, apart from my suggestion in my answer to question 10.